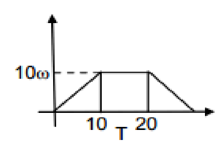
HC Verma Solutions Rotational Mechanics

http://www.learncbse.in/rotational-mechanics-hc-verma-concepts-physics-solutions/
https://goo.gl/3XPBG2
http://cbsetuts.blogspot.in/2018/01/hc-verma-solutions-rotational-mechanics.html
https://goo.gl/h39D3R
https://goo.gl/EzyLgs
https://goo.gl/s4QEF7

Rotational Mechanics HC Verma Concepts of Physics Solutions

Rotational Mechanics HC Verma Concepts of Physics Solutions Chapter 10

1. $\omega_0 = 0$; $\rho = 100$ rev/s ; $\omega = 2\pi$; $\rho = 200\ \pi$ rad/s
   $\Rightarrow \omega = \omega_0 = \alpha t$
   $\Rightarrow \omega = \alpha t$
   $\Rightarrow \alpha = (200\ \pi)/4 = 50\ \pi$ rad /s^2 or 25 rev/s^2
   $\therefore \theta = \omega_0 t + 1/2\ \alpha t^2 = 8 \times 50\ \pi = 400\ \pi$ rad
   $\therefore \alpha = 50\ \pi$ rad/s^2 or 25 rev/s^s
   $\theta = 400\ \pi$ rad.
2. $\theta = 100\ \pi$; t = 5 sec
   $\theta = 1/2\ \alpha t^2 \Rightarrow 100\pi = 1/2\ \alpha\ 25$
   $\Rightarrow \alpha = 8\pi \times 5 = 40\ \pi$ rad/s = 20 rev/s
   $\therefore \alpha = 8\pi$ rad/s^2 = 4 rev/s^2
   $\omega = 40\pi$ rad/s^2 = 20 rev/s^2.
3. Area under the curve will decide the total angle rotated
   $\therefore$ maximum angular velocity = 4 × 10 = 40 rad/s
   Therefore, area under the curve = 1/2 × 10 × 40 + 40 × 10 + 1/2 × 40 × 10
   = 800 rad
   $\therefore$ Total angle rotated = 800 rad.



4. $\alpha = 1$ rad/s^2, $\omega_0 = 5$ rad/s; $\omega = 15$ rad/s
   $\therefore w = w_0 + \alpha t$
   $\Rightarrow t = (\omega - \omega_0)/\alpha = (15 - 5)/1 = 10$ sec
   Also, $\theta = \omega_0 t + 1/2\ \alpha t^2$
   $= 5 \times 10 + 1/2 \times 1 \times 100 = 100$ rad.
5. $\theta = 5$ rev, $\alpha = 2$ rev/s^2, $\omega_0 = 0$; $\omega = ?$
   $\omega^2 = (2\ \alpha\ \theta)$
   $\Rightarrow \omega = \sqrt{2 \times 2 \times 5} = 2\sqrt{5}$ rev/s.
   or $\theta = 10\pi$ rad, $\alpha = 4\pi$ rad/s^2, $\omega_0 = 0$, $\omega = ?$

$\omega^2 = (2\,\alpha\,\theta)$

$\Rightarrow \omega = \sqrt{2 \times 2 \times 5} = 2\sqrt{5}$ rev/s.

or $\theta = 10\pi$ rad, $\alpha = 4\pi$ rad/s^2, $\omega_0 = 0$, $\omega = ?$

$\omega = \sqrt{2\alpha\theta} = 2 \times 4\pi \times 10\pi$

$= 4\pi\sqrt{5}$ rad/s $= 2\sqrt{5}$ rev/s.

6. A disc of radius = 10 cm = 0.1 m

   Angular velocity = 20 rad/s

   $\therefore$ Linear velocity on the rim = $\omega r = 20 \times 0.1 = 2$ m/s

   $\therefore$ Linear velocity at the middle of radius = $\omega r/2 = 20 \times (0.1)/2 = 1$ m/s.

7. t = 1 sec, r = 1 cm = 0.01 m

   $\alpha = 4$ rd/s^2

   Therefore $\omega = \alpha t = 4$ rad/s

   Therefore radial acceleration,

   $A_n = \omega^2 r = 0.16$ m/s^2 = 16 cm/s^2

   Therefore tangential acceleration, $a_r = \alpha r = 0.04$ m/s^2 = 4 cm/s^2.

8. The Block is moving the rim of the pulley

   The pulley is moving at a $\omega = 10$ rad/s

   Therefore the radius of the pulley = 20 cm

   Therefore linear velocity on the rim = tangential velocity = $r\omega$

   = 20 × 20 = 200 cm/s = 2 m/s.